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## EROSION CONTROL PRACTICES DIVISION

The Value of Contouring, Terracing and Strip-Cropping - H. H. Finnell, Amarillo, Texas.-"Only a small part of the rainfall finds its way into the growing crops. Much of it goes to waste. Moisture doesn't hit the spot until you get it down into the subsoil underneath the surface mulch. There it is actually taken up by roots and used by the growing crop.

"First, let us examine the natural set-up. I have the figures beginning at southwest Kansas for the southern high plains. Out of a year's rainfall about 21 percent goes into the ground, 13 percent runs off, and 66 percent evaporates. Some years 21 percent of what falls will make a good crop, and some years it won't. Some of both the runoff and the evaporation waste can be saved if you can make it soak into the ground faster. The 13 percent that runs off is less than 2-1/2 inches out of an 18-inch rainfall. If that's broken up in three or four rains, it can easily be held in place and all runoff completely prevented by contour farming, supported by terracing where needed. But when you stop 2-1/2 inches of water from running off the surface, it does not add that much to the subsoil store. While it is standing there in the furrow waiting to soak in, two-thirds of it will evaporate. Therefore, the storage efficiency of impounded surface water is only 33-1/3 percent. This is a poor substitute for a good rain, because the average storage efficiency of a rightsized rain is 37.4 percent. However, just 0.8 or 0.9 of an inch of net available water, all of which can be added to the natural moisture supply actually taken up by the crop, will kick the grain yield 2 to 4 bushels per acre.

"Experimental results from Garden City: a 6-year average shows that contour farming increased wheat yields 2.8 bushels per acre under a 19-inch rainfall. At Goodwell, Oklahoma a 10-year average showed that wheat yields were upped 3.1 bushels per acre under a 17-inch rainfall; at Cherokee, Oklahoma under a 25-inch rainfall the 4-year average results gave an increase of 1.8 bushels per acre. Turning from wheat to corn, in Missouri on sandy soils of 12 percent slope, under a 35-inch rainfall corn yields were increased 30 percent. On a different soil type, a silt loam of 4 percent slope, contour farming gave only a 5 percent increase. These results indicate that under excessive rainfall conditions the soil type and

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slope determine the yield getting usefulness of contouring. Under semi-arid rainfall the percentage of gain was related to the frequency of drouth. At Cherokee, Oklahoma a 10.9 percent increase was observed; at Garden City with 6 inches less of rainfall a year surface water retention made a 15 percent increase; while at Goodwell, Oklahoma with 8 inches less, a 36 percent increase was observed. Field observations over the Southern High Plains showed that 369 farmers made an average of 2.99 bushels more on contour farmed, terraced land than 386 farmers without surface water control.

"No one should get the idea that this yield increase is a gift. You have to work for it. One of the biggest mistakes a farmer ever made was to build terraces under the delusion that they would do part of his farming for him. Terraces necessitate the performing of strip operations. Thus, more time is required for a given job. Nevertheless, under favorable conditions the return has usually been profitable. The best wheatland results were obtained on slopes of from 1/2 of 1 percent up to 1-1/2 percent. On steeper slopes it is more difficult to keep the water spread out and outlets must be provided to avoid flooding. Even under water erosion conditions the water conserving effect of contour farming frequently pays off, also.

"The gains made from runoff control are over and above those obtained from summer fallow. The terrace gains above that made by summer fallow alone were 2.91 compared to the over-all average of 2.99 bushels. Under wind erosion conditions a solid field with surface protection of straw or trash is better than strip protection, but strips of stubble fit in well where clean tilled fallow or an erosion non-resistant crop is desirable. The safe widths are a matter of local experience. They might vary from 1 rod, as on sandy cotton land, to 10 rods or more on wheat land."

Conservation Practices Give Improved Cotton Yield - George W. Hood, Batesville, Arkansas.-"When you total the yields for the past three years, as shown in the table, you find a substantial gain in yield for those plots on which conservation practices have been used as contrasted to those where they were not in operation. In spite of the adverse weather, these records show that the individual has within his power the ability to secure satisfactory yields if he will follow conservation and good farming practices.

Comparative Cotton Yields

| Practice | Pounds Seed Cotton | | | |
|---|---|---|---|---|
| | 1946 | 1945 | 1944 | Total |
| Continuous cotton | 175 | 128 | 258 | 561 |
| Cotton in rotation on contour | 874 | 752 | 490 | 2116 |
| Continuous cotton | 402 | 473 | 669 | 1544 |
| Strip crop - in rotation on contour | 663 | 889 | 885 | 2437 |

"A study of the table shows a decided advantage for the conservation practices, and the increased yields over a period of three years range from almost double to over three times that of the old practice. As the years pass, the difference will increase and a wider gap between conservation and non-conservation is sure to take place."

Yield of Winter Wheat in Bushels Per Acre from Various Initial Tillage and Residue Treatments - 1946 - Hugh C. McKay, St. Anthony, Idaho.-

| Type of Plowing | Residue Treatments | | | Average |
|---|---|---|---|---|
| | Stubble Burned | Stubble cut & Removed | Stubble Utilized | |
| Moldboard | 29.9 | 28.7 | 28.5 | 29.0 |
| Modified Moldboard | 29.4 | 29.2 | 28.1 | 28.1 |
| Average | 29.7 | 29.0 | 28.3 | |

"As shown by the above data no large differences were found between any of the data. The stubble burned plots yielded .7 of a bushel more than where the stubble was cut and removed and 1.4 bushels more than where the stubble was utilized. The average yields for the types of plows are nearly identical with only a difference of .1 bushels per acre."

Good Soil Moisture For Wheat - A. E. Lowe, Garden City, Kansas.- "This exceedingly wet fall has caused a moisture penetration of the soil much deeper than usual. On continuously cropped land the penetration is now about four feet which is about average for fallow and on fallow it is down to about eight feet. This deep soil moisture penetration coupled with the excellent root and top growth made this fall virtually assures a good wheat crop in this area next harvest barring some unpredictable catastrophe."

Wheat After Lespedeza Seed Crop - T. L. Copley, Raleigh, N. C.- "Lespedeza seed were combined from 12 to 15 acres, and the seeding of wheat crop was completed with seeding of several acres following this lespedeza. This practice of following winter grain behind combined lespedeza may have delayed wheat seeding too late for best results."

The Influence of Winter Cover Crop on Sweet Corn Yields - O. R. Neal, New Brunswick, New Jersey.-"The value of winter cover crops in reducing soil and water losses both during the winter season and the subsequent cultivated season has been shown repeatedly. During a 4-year period on the Marlboro plots, land cultivated each season and having no winter cover crop lost 19.8 tons of soil per acre. Cultivated land where rye was grown each winter season lost 11.4 tons of soil during the same period of time.

"A study is now in progress to determine the influence of different winter covers on the yield of subsequent cultivated crops. In 1946, sweet corn following rye as a winter cover produced 4740 pounds per acre. Following ryegrass the sweet corn yield was 4330 pounds per acre. When a ryegrass and vetch mixture was used the sweet corn yield was 7920 pounds per acre. Yields were measured from replicated areas in all cases. The corn following ryegrass and vetch had a darker color and showed more vigorous growth throughout the season. The comparison is being continued."

Physical Condition of the Soil as Affecting Corn Yields - J. S. Andrews (Irrigation data contributed by E. A. Engdahl), Arnot, New York.- "Crops vary in their effect on the soil and in the resistance the soil may offer to erosion. Grass mixtures retard erosion and add organic matter, while the opposite is true of a crop like corn.

"Plots which were previously farmed to various crops and treatments, were, in the spring of 1946, all treated the same. A heavy application of fertilizer was applied in order that yield differences would be due principally to the physical condition of the soil rather than differences in plant food.

"The plots were treated to an application of 1,000 pounds 10-10-10 per acre and spaded. Sufficient limestone was added where needed to equalize the pH.

"The results are rather striking and are presented in the following table:

Effect of systems of soil management on soil loss and on growth, yield and maturity of corn

| Previous soil management | Years | Total soil loss | Height 7-28-46 | Yield Per acre | Mature ears |
|---|---|---|---|---|---|
| | No. | Tons/acre | Feet | Bushel | Percent |
| Meadow, grass & clover plus LPK[1] | 11 | 0 | 5.0 | 88 | 48 |
| Rotation, corn-oats-clover plus MLP[1] | 11 | 3 | 4.7 | 64 | 58 |
| Rotation, corn-oats-clover | 11 | 8 | 4.6 | 38 | 30 |
| Rotation, potatoes-sweet clover plus[2] | 11 | 13 | 3.5 | 57 | 44 |
| Buckwheat continuous | 8 | 23 | 2.5 | 46 | 31 |
| Corn continuous plus 200 lb. 5-10-5 | 11 | 34 | 2.4 | 35 | 0 |
| Corn continuous | 11 | 48 | 1.7 | 33 | 0 |
| Fallow, stones in place | 11 | 74 | 1.9 | 19 | 0 |
| Fallow, stones removed[3] | 11 | 138 | 1.7 | 24 | 0 |

1 M - farm manure 6 tons before corn; L - limestone sufficient to grow clover; P - superphosphate 600 lb.; K - 100 lb. muriate potash; before seeding 1935.

2 Twelve hundred pounds 5-10-5 before potatoes.

3 Stones above 2 inches largest diameter.

Effect of Water, Fertilizer and Row Spacing on Potato Yields - "Yields were increased by the following treatments:

1. Adding water with a sprinkler irrigation system.

2. Close row spacing of seed pieces.

3. Increased fertilizer rate.

"Three blocks of plots were laid out, each block containing 18 plots, each 18 feet square. All seed pieces were planted 12 inches apart in the row but different row spacings were tried. Water was added when needed, as shown by high soil tensions during July, August and September. A new blight resistant variety of potato named 'Glenmeer', developed by Cornell's Vegetable Crops Department, was used in the study. Only insect control was required and this was accomplished with three applications of DDT spray during the season.

"The average yields from the three blocks are tabulated below:

| Water Source | Water, inches | Yield, bushels per acre | | | | | |
|---|---|---|---|---|---|---|---|
| | | One ton 5-10-10 | | | Two tons 5-10-10 | | |
| | | 12" | 18" | 36" | 12" | 18" | 36" |
| Rain plus 2 levels of water | 18.2 | 451 | 458 | 348 | 513 | 490 | 451 |
| Rain plus 1 level of water | 16.0 | 426 | 407 | 362 | 524 | 495 | 399 |
| Rain only | 13.7 | 345 | 424 | 309 | 462 | 465 | 373 |

"Size of tubers was influenced by spacing. The 36-inch rows produced potatoes 14 percent of which were above 4 inches diameter, and were hollow and unmarketable compared with 3 percent for the 18-inch rows and 2 percent for the 12-inch rows."

Yield of Sericea as Affected by Fertilizer Treatment - E. C. Richardson, Auburn, Alabama.-"An area of sericea was established in May, 1944, on Cecil Sandy Loam just North of Auburn. No fertilizer was applied except lime. Where lime occurred in the treatment, it was applied just prior to seeding, and was worked into the soil. Phosphate and potash treatments began early in 1945. These and subsequent applications were surface applied without any cultural treatment.

"In 1945, the check plots produced approximately 10,500 pounds of green sericea per acre. In 1946, this yield dropped to approximately 8,500 pounds per acre. This field was in general crops through 1943. Small applications of fertilizer probably were applied to these crops, but were not sufficient to hold the sericea yields up for two years.

"Proportionately the greatest boost in yield occurred as a result of applying 200 pounds of superphosphate. However, heavier rate of phosphate produced higher yields, though the increase resulting from the second 200 pounds was not nearly as great as that produced from the first 200 pounds. Both potash and lime resulted in slight increase."

Effect of Seedbed Preparation on Yields of Alfalfa-Brome, 1946 - C. A. Van Doren, Dixon Springs, Illinois.-

| Date of Seeding | Method of Seedbed Preparation | |
|---|---|---|
| | Discing | Plowing |
| Fall 1944 (1) | 5429 Lbs/A | 6268 Lbs/A |
| Fall 1945 (1) | 4727 " | 5919 " |
| Average Seedings, 1944 and 1945 | 5078 " | 6094 " |
| Spring 1946 (2) | 1416 " | 1320 " |

(1) Three Cuttings. (2) One Cutting.

"The plowed plots outyielded the disced plots by approximately one-half ton per acre on established stands where three cuttings could be secured. During the past winter, following establishment of fall seedings, erosion control was observed to be much better on the disced than on the plowed plots. However, the cost of seedbed preparation by discing has been considerably greater than by plowing. As many as six cuttings are required to make a satisfactory seedbed with a heavy tandem disc on land with a heavy covering of brome sedge. In the fall of 1947 a plot was prepared with a Killifer disc. One cutting with this disc seemed to be as effective as three or four cuttings with a heavy tandem disc harrow."

Determination of Permanent Wilting Point by Pressure of Fifteen Atmospheres - T. C. Peele, Clemson, S. C.-"A sample of three to five grams of air dry soil (2.00 mm.) is placed in a Gooch crucible with a filter paper disk in the bottom. The crucible is set in a moisture chamber and distilled water is added in the chamber until the level is about the same as that of the soil in the crucible.

"The soil is allowed to saturate for at least two hours. The Gooch crucible is inverted over the dry cellophane membrane of the pressure cylinder, and gently tapped on the bottom to dislodge the soil and filter paper disc. The filter paper is removed with a pair of forceps, and a rubber tipped stirring rod is used to spread the soil (without puddling) in a layer about 1 to 2 mm. thick.

"The cylinder is clamped in place and the pressure is raised to 225 lbs. per square inch. After 24 hours the pressure is released and a moisture determination is made on the soil.

"The wilting points of twenty-one soils were determined by the conventional plant method and by the pressure method. Each pair of values found by the two methods was plotted and the regression line was fitted to the points.

The regression equation is, Y=0.97X + 0.99. The standard error of estimate was 0.54 percent moisture.

"The values for the wilting point by the two methods are shown in table 1. The calculated percent was obtained by using the equation for the regression line, Y=0.97X + 0.99, when X = moisture percentage at 15 atmospheres pressure, and Y = calculated permanent wilting percentage.

"The mean difference between the wilting points calculated from the 15 atmosphere moisture percentages and the wilting points determined by the plant method was 0.41% water. Replicates by the pressure method were less variable than replicates by the plant method. The mean differences between replicates were 0.169% water for the plant method and 0.09% water for the pressure method.

Table 1. Permanent wilting points by the plant method compared with percentage of moisture afterpressure of fifteen atmospheres.

| Soil Type | Horizon | Wilting Point | | |
|---|---|---|---|---|
| | | Plant Method | Pressure method* | Calculated percent |
| Norfolk sandy loam | A | 1.65 | 1.06 | 2.02 |
| Norfolk sand | A | 1.77 | 1.14 | 2.10 |
| Dunbar sandy loam | A | 2.21 | 1.51 | 2.46 |
| Marlboro sandy loam | A | 2.94 | 2.60 | 3.52 |
| Lynchburg sandy loam | A | 3.54 | 2.22 | 3.15 |
| Wickhan sandy loam | A | 3.81 | 2.84 | 3.75 |
| Lynchburg sandy loam | B | 5.68 | 4.23 | 5.10 |
| Cecil sandy loam | A | 6.33 | 5.50 | 6.34 |
| Iredell silt loam | A | 6.41 | 5.83 | 6.66 |
| Norfolk Sandy loam | B | 7.46 | 6.71 | 7.52 |
| Georgeville silt loam | A | 7.69 | 5.74 | 6.57 |
| Dunbar sandy loam | B | 7.89 | 6.58 | 7.39 |
| Marlboro sandy loam | B | 10.22 | 9.64 | 10.37 |
| Cecil clay loam | A | 10.62 | 10.44 | 11.15 |
| Lloyds clay loam | A | 12.51 | 11.90 | 12.57 |
| Davidson clay loam | A | 17.58 | 17.45 | 17.97 |
| Wickham silt loam | B | 18.35 | 17.48 | 17.99 |
| Lloyds clay loam | B | 19.43 | 19.42 | 19.88 |
| Davidson clay loam | B | 22.79 | 21.24 | 21.65 |
| Iredell silt loam | B | 23.04 | 23.49 | 23.84 |
| Georgeville silt loam | B | 24.39 | 23.90 | 24.24 |

*Percent water, over dry basis, retained at equilibrium with 15 atmospheres pressure over a cellophane membrane."

Earthworms Increased Threefold by Liming in Rotations - Henry Hopp, Beltsville, Maryland.-"There has recently been much discussion in garden and farm magazines as to the effects of inorganic amendments on earthworms. One aspect of this matter is the effect of lime. Last month we made an earthworm survey at the Maryland Agricultural Experiment Station in 3-year

rotation plots that had been maintained at three pH levels, 5.5, 6.5 and 7.5 by the application of lime. The results were as follows:

| Crop This Past Season | Weight of Worms Per Acre at pH -- 5.5 (lb.) | 6.5 (lb.) | 7.5 (lb.) | Average For Crop (lb.) |
|---|---|---|---|---|
| Corn | 144 | 89 | 465 | 233 |
| Wheat | 182 | 209 | 433 | 275 |
| Hay | 70 | 273 | 510 | 284 |
| Average for pH | 132 | 190 | 469 | |

"The observations indicate that earthworms are greatly favored by liming this soil. The lime was applied for the corn and wheat. At pH 5.5, the lime effect apparently did not hold over through the hay year of the rotation. The earthworms population fell off. At pH 7.5, on the contrary, the worms were most abundant at the end of the hay year. Maintenance of a high worm population in rotations on this soil seems to be dependent on liming. The results also raise the question as to whether the soil aggregating effects commonly attributed to lime may not in large part result from the stimulation of the earthworms."

Cropping Systems in Relation to Soil Organic Matter - Richard M. Smith, Morgantown, West Virginia.-"Analyses of the bin plots for organic matter where the cropping systems have been continued for 7 years, starting with uniformly mixed soil gave the following results (2 replicate plots of each system):

| | Average % | Sample Depth |
|---|---|---|
| Continuous buckwheat | 2.07 | 0-6 |
| C. corn | 2.08 | 0-6 |
| C. soybeans | 2.26 | 0-6 |
| C. sudan | 2.20 | 0-6 |
| C. oats | 2.21 | 0-6 |
| C. wheat | 2.50 | 0-6 |
| Corn (rye vetch) | 2.39 | 0-6 |
| C. wh. clov. | 2.41 | 0-6 |
| C. wh. clov. tim. 2 years | 2.54 | 0-6 |
| C. wh. alfalfa 2 years | 2.67 | 0-6 |
| Fallow (some weeds) | 2.57 | 0-3 |
| Fallow (some weeds) | 2.09 | 3-6" |
| Korean lesped. (nothing removed) | 3.34 | 0-3 |
| Korean lesped. (nothing removed) | 2.21 | 3-6 |
| Timothy | 2.81 | 0-3 |
| Timothy | 2.16 | 3-6 |
| Alfalfa | 2.72 | 0-3 |
| Alfalfa | 2.30 | 3-6 |
| Kentucky bluegrass & wh. clov. | 2.90 | 0-3 |
| Kentucky bluegrass & wh. clover | 3.40 | 0-1-1/2 |
| Kentucky bluegrass & wh. clover | 2.40 | 1-1/2-3 |
| Kentucky bluegrass & wh. clover | 2.15 | 3-6" |

"The total spread for the various systems is of considerable interest, also the differences with depth shown for the several plots which have not been stirred since the start of the experiment. The values by depth show that more organic matter is being built close to the surface in all cases. Alfalfa is apparently building more organic matter at the 3-6 inch depth than the other permanent covers, although the stand of alfalfa has not been very good for several years. The organic matter content of the fallow plots continues to be surprisingly good. The lespedeza plots are adjacent to the wheat, and some volunteer lespedeza persistently comes up in the wheat plots. This may have some influence on the values for continuous wheat."

Grazing Studies - C. J. Whitfield, Amarillo, Texas.-"The continuation of the 1945 drought into 1946 affected the yields of grass and greatly curtailed the amount of grazing possible on the different pastures.

Grass forage production, air dry weight, for 1946. (Clippings were made at 1/2 inch except for weeping lovegrass which was at 2 inches)

| Order | Pounds Per Acre | Pasture | Grasses |
|---|---|---|---|
| 1 | 962 | F-2 | Weeping lovegrass, dryland |
| 2 | 546 | I-4 | Crested wheatgrass |
| 3 | 392 | A-1 & 7 | Seeded mixture: blue grama, sideoats, weeping lovegrass |
| 4 | 328 | F | Seeded western wheatgrass |
| 5 | 324 | I-2(E) | Seeded mixture; blue grama, western wheatgrass |
| 6 | 311 | I-2(W) | Seeded mixture: western wheatgrass, blue grama |
| 7 | 242 | I-1 | Native upland blue grama, buffalo grass on good soil |
| 8 | 174 | Bush | Native upland blue grama, buffalo grass, grazed heavily |
| 9 | 155 | H | Native upland blue grama, buffalo grass |
| 10 | 138 | H | Native western wheatgrass, buffalo grass |

"The amount of growth made in the drought period was small, except for weeping lovegrass and crested wheatgrass, and would not justify much grazing unless carryover grass were present. The growth was only enough to protect the soil."

Winter Grazing on Kudzu Land - B. H. Hendrickson, Watkinsville, Georgia.-"Both volunteering smooth vetch and wild winter peas oversown on summer-grazed kudzu on Class IV land without tillage are making excellent growth to provide green winter grazing on kudzu land during its dormant period.

Station Data as Evidence in Court - "Station data on the effect of differences in topsoil depth on cotton yield were used by a real estate agent in Marietta, Georgia, as evidence of the land-damaging effect of removing topsoil from fields for topsoiling dirt roads. He sought to secure an injunction against the practice in a case before the Grand Jury."

Beef Production on Renovated Bluegrass Pasture - Dwight D. Smith, Columbia, Missouri.-"The renovated bluegrass pasture produced 252 pounds of beef per acre during 1946. This was the maximum it has produced during the 4 years of records. The check area produced 132 pounds beef per acre and the contour-furrowed area only 60 pounds per acre. This latter area lost 31 pounds beef per acre during the fall grazing season; whereas the check area showed a gain of 14 pounds per acre, and the renovated area a gain of 60 pounds per acre. There has been a gradual decrease in production on the contour-furrowed area in relation to that from the check area, and a gradual increase in production from the renovated area in relation to that from the check area. The increased absorption of water on the contour-furrowed area without soil treatments has been a detriment to the bluegrass on this clay-pan soil area. Average annual production for the three areas during the 4 years of records has been:

| | |
|---|---|
| Renovated bluegrass pasture | 151 lb. beef/acre |
| Check bluegrass pasture | 115 lb. beef/acre |
| Contour-furrowed bluegrass pasture | 103 lb. beef/acre |

November Rains Caused Heavy Erosion on Bare Ground - Russell Woodburn, State College, Mississippi.-"Soil loss from the bare plot on a 9% slope was heavy during the month:

| | | |
|---|---|---|
| 8 T/A | Nov. 7 | 1.71" rain |
| 6 T/A | Nov. 10/11 | 3.02" rain |
| 2 T/A | Nov. 17 | 0.88" rain |
| 2 T/A | Nov. 26 | 0.96" rain |

"There was no soil loss and only a trace of runoff from the plots covered with cotton stalks and trash.

"Some good data were recorded for the November rains from the raindrop energy study. This setup had not produced any data for about 2 months due to low rainfall in October and September. A study of these data has been started in an attempt to correlate plot end losses with measured drop energy. Direct correlation obviously would not work, so runoff amount was introduced into the expression used. Even then correlation was low. It would appear that amount of soil lost from the plot should, to some extent, reflect the amount of energy applied to displace the soil and the amount of runoff which was available to move displaced soil. The low correlation obtained is believed partially due to the characteristics of the Houston clay soil on the plot used. Fragmentation of this soil, by drying and wetting at the immediate surface, may make variable amounts of material available for removal without too much regard for the amount of applied raindrop energy.

"This matter will receive more attention."

Effect of Winter Cover and Plant Residues on Soil Erosion - H. O. Hill, Temple, Texas.-"The storms during November demonstrated effectively the soil saving effect of winter cover and plant residue management. Practically no soil was lost from areas having a good cover of hubam or oats where the crop residue from this year's clover crop had been worked into the surface soil, whereas 3.42 tons per acre were lost during November from the plot that was open plowed after corn. (See following table)

| Date of Storm | Rainfall | | Residue of clover crops | | Open plowed after corn | | Hubam clover 6" tall | |
|---|---|---|---|---|---|---|---|---|
| | 30-min. intensity | Total | Runoff | Soil Loss | Runoff | Soil Loss | Runoff | Soil Loss |
| | ins/hr. | ins. | inches | T/A | inches | T/A | inches | T/A |
| Nov. 1, 2 & 3 | 1.88 | 1.88 | None | None | 0.479 | 0.20 | 0.008 | 0.03 |
| Nov. 15 & 16 | 2.90 | 2.68 | 0.004 | 0.02 | 1.421 | 2.78 | .161 | .08 |
| Nov. 25 & 26 | 1.00 | .88 | .011 | .03 | .346 | .44 | .003 | Trace |
| Total | | 5.44 | .015 | .05 | 2.246 | 3.42 | 0.172 | .11 |

Snow Cover Retention in Relative Surface Residue - Ralph A. Cline, Brookings, South Dakota.-"During November observations were made of the snow cover on the various tillage and residue plots. The amount of snow retained and its uniformity throughout the plots varied with the amount of residue left to trap and hold the snow. Very little snow was visible on the corn plots. Previous tillage or residue treatment didn't appear to make much difference. However, on the small grain plots tilled this fall there was considerable difference. Moldboard plowed plots were conspicuous by the absence of snow. The oneway disked plots were holding some snow but it was only slightly more than mowed and six-inch subtilled stubble. On the oneway disked plots the six-inch stubble appeared to be holding more snow than the twelve-inch or combined stubble. This can possibly be attributed to the position they hold in the experimental design. Combined stubble that had been subtilled was exceptionally outstanding in the amount of snow retained. On these plots the snow was 5 to 6 inches deep and very uniformly distributed throughout."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"In connection with the preparation of a paper for the Soil Science Society of America, F. R. Dreibelbis summarized and tabulated some of the plant nutrient losses in gravitational water. These results in the accompanying table were obtained by analyzing the percolation water collected at the bottom of our 8-feet deep lysimeters. Data for a complete 4-year rotation are given. Manure is plowed down for corn and applied as top dressing on wheat. Fertilizer is applied for the corn and wheat crops. No plant residues are returned to the land other than that in the manure. Lime is applied to the land when it is in wheat.

"Many useful and interesting comparisons can be obtained from the data in this table. It is believed that a somewhat legitimate comparison of plant nutrient losses can be made between these data on percolation and those losses in surface runoff reported by R. B. Hickok for the Lafayette, Ind. watersheds."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"For November precipitation fell between the 5th and 10th and totaled 2.04 inches which is 1.09 inches above normal. All the precipitation fell in the form of rain, with the exception of about 2 inches of snow which fell on November 9. There was some runoff during the period November 5th to 10th, however cover conditions favored a good intake of water. The fall wheat had obtained a good growth and the corn and oats residues offered good protection to the ground surface.

"Since July 1, we have had 19.0 inches of rain, which is 8.0 inches above normal based on the 51-year record at Red Cloud and Hastings, Nebr. The late summer and fall rains have added materially to the soil-moisture content, especially since the evaporation decreases rapidly with the season of the year; for example, during July this year 12.18 inches evaporated from the 4 foot U. S. Weather Bureau pan as compared to 2.07 inches evaporation during November. The following table shows the comparison of water content in the upper 3 feet of soil for the past 8 years.

Constituents of lysimeter percolates, 1941-1944
(Expressed in pounds per acre per year).

| Year | Lysimeter | Land use | Ca | Mg | K | Mn | N | S | Si | Percolation | Runoff | Precipitation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Inches | Inches | Inches |
| 1941 | 1/ Y102 | Corn | 11.6 | 5.7 | 3.6 | 0.2 | 2.6 | no data | 2.8 | 2.61 | 15.24 | 39.83 |
| " | 2/ Y103 | " | 13.8 | 6.1 | 13.8 | .1 | 0.6 | 8.1 | 8.1 | 2.57 | 10.34 | 39.62 |
| 1942 | Y102 | Wheat | 11.0 | 7.9 | 4.8 | .2 | 3.6 | 4.1 | 4.3 | 4.40 | .43 | 37.03 |
| " | Y103 | " | 13.0 | 4.8 | 7.6 | .2 | 1.0 | 10.9 | 5.9 | 5.65 | .93 | 37.03 |
| 1943 | Y102 | Meadow | 32.5 | 21.7 | 9.5 | .8 | 6.6 | 4.5 | 13.6 | 11.22 | .19 | 32.97 |
| " | Y103 | " | 34.5 | 20.4 | 23.5 | .6 | 2.5 | 37.7 | 14.9 | 6.62 | .68 | 31.93 |
| 1944 | Y102 | Meadow | 16.3 | 14.0 | 7.2 | .3 | 3.7 | 3.5 | 8.8 | 6.99 | .18 | 30.71 |
| " | Y103 | " | 21.6 | 18.0 | 19.1 | .4 | 4.4 | 22.5 | 9.7 | 4.84 | .09 | 29.60 |

1/ Muskingum silt loam. Data are averages of three lysimeters.

2/ Keene silt loam. Data are averages of four lysimeters.

Table 1.--Number of inches of water in top 3 feet of soil

| Date | Meadow | Cultivated |
|---|---|---|
| | Inches | Inches |
| Sept. 26, 1939 | 6.0 | 6.5 |
| Nov.25-Oct.4, 1940 | 7.2 | 8.2 |
| Nov. 20, 1941 | 10.5 | 8.3 |
| Nov. 20, 1942 | 11.2 | 9.3 |
| Nov. 20, 1943 | 4.8 | 4.9 |
| Nov. 20, 1944 | 10.2 | 9.6 |
| Nov. 20, 1945 | 7.9 | 8.2 |
| Nov. 20, 1946 | 13.6 | 12.4 |
| 8-Year Average | 8.9 | 8.4 |

This table shows that we have 4.7 inches more water stored in the top 3 feet of soil on meadow, and 4.0 inches more on cultivated land as compared to the last 8-year average, which will make a material difference in the 1947 crop production."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.- "Mr. Bedell reports the yields from the 1946 soybean plots on the Throckmorton plots as follows:

Table 1.--Soybean Yields from Crop Residue Management Experiment Plots, 1946
Purdue-Throckmorton Farm, Lafayette, Ind.
(Averages of triplicated plots)

| Fertilizer rate2/ | Treatment numbers 1/ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| High | 8.8 | 3.8 | 5.4 | 9.2 | 8.1 | 12.8 | 14.1 | 14.6 |
| Low | 7.7 | 4.3 | 4.4 | 9.6 | 8.0 | 12.1 | 13.8 | 13.9 |

1/The tillage treatments referred to by number are the same as those used for corn on same plots in 1945, except that treatment number one was different. Tillage treatments used were as follows:

1. Clover sod was disked twice to a depth of 3 inches. (There was no corn grown on these plots in 1945 and a good clover sod remained).
2. Surface mulch, tillage to 3 inch depth.
3. Surface mulch, tillage to 7 inch depth.
4. Residue mixed, 0-3 inch depth, tillage 3 inches.
5. Residue mixed, 0-3 inch depth, tillage 7 inches.
6. Residue mixed 0-7 inch depth.
7. Residue turned under 7 inches.
8. Residue turned under 4 inches.

2/No fertilizer was applied in 1946 for soybeans. Fertilization rates indicated refer to the rates used for corn on these plots in 1945.

"Soybeans were seeded on the plots on June 28. Frost stopped their growth on October 1 before they were mature which was largely responsible for the relatively low yields.

"Mr. Bedell states that the least difference required for significance (at 5 percent level) between tillage treatments is 6.3 bushels, and 4.2 bushels between fertilization rates. The data indicate a definite trend of advantage in yield for depth of tillage and turning under of residues. Compared to conventional plowing, however, the yields are indicated to be significantly lower only for the surface mulch treatments. There were no significant differences resulting from differences in fertilization rates of the antecedent crop.

"The yields are all extremely low, indicating the possibility that effects of the experimental treatments were limited by other factors. This is the second year of differential treatment and the first bean crop on these plots."

Hydrologic Studies - R. G. White, East Lansing, Michigan.- "The 1946 corn yield at watershed 'A' was considerably above the average for central Michigan this year. The yield was 37.6 bushels of dry corn and 2,421 pounds of stover per acre. This yield is considered excellent when one considers that the 1946 rainfall is nearly 10 inches below normal, and that for the 80-day period from June 20 to September 8, only 1.06 inches of rain fell.

"The 1946 corn yields at the stubble-mulch culture plots have been determined and are given in the following table. Corn yields for 1943, 1944, and 1945 are also given.

Table 1.--Corn, stubble mulch culture plots

| | Tillage treatment | | | |
|---|---|---|---|---|
| | Plow | Disk | Sweeps | Plow, moldboard removed |
| 1943, Grain, bu. per acre | 33.9 | 36.9 | 32.4 | 22.6 |
| 1944, " " " " | 12.2 | 9.7 | 15.0 | 14.2 |
| 1945, " " " " | 36.1 | 37.5 | 29.7 | 29.3 |
| 1946, " " " " | 11.7 | 11.1 | 8.1 | 12.2 |
| Average | 23.5 | 23.8 | 21.3 | 19.6 |
| 1943 Stover, lbs per acre | 3,645 | 3,765 | 3,345 | 2,575 |
| 1944 " " " " | 3,821 | 2,399 | 2,981 | 2,765 |
| 1945 " " " " | 3,099 | 3,573 | 2,646 | 2,686 |
| 1946 " " " " | 2,101 | 1,987 | 2,087 | 2,051 |
| Average | 3,167 | 2,931 | 2,765 | 2,519 |

"The method of preparing the seed bed appears to have a definite influence on the release of nitrates for plant use. The 1943 and 1945 seasons were exceedingly wet at corn planting time. On the plowed plots, where organic matter was covered deeply in a saturated soil, nitrogen-deficiency symptoms were noted when the corn was quite small. On the surface-treated plots, however, nitrogen deficiencies did not develop. During the 1944 and 1946 corn planting seasons, the soil was quite dry. Under these conditions, bacterial action did not take place rapidly in the surface-treated plots, and they developed nitrogen-deficiency symptoms while the plowed plots did not."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"There was a total rainfall of 4.86 inches at Station 69 for the month of November. The mean for Waco for November is 2.60 inches. Measurable precipitation fell on 11 days, but high rainfall rates occurred only on 1 day. On November 3rd there was a 1.71 inch rain in a 1-hour period and a 1.55 inch rain in 30 minutes. This storm caused considerable field runoff. The peak rates of runoff at the stations now in operation were as follows:

| Sta. No. | Area in acres | Treatment | Peak runoff rate | |
|---|---|---|---|---|
| | | | cfs | ins./hr. |
| Y | 309 | Conservation Practices | 57.8 | 0.183 |
| Y-2 | 132 | Conservation Practices | 39.7 | .298 |
| Y-4 | 79.9 | Conservation Practices | 23.2 | .288 |
| Y-10 | 21.0 | Conservation Practices | 15.2 | .718 |
| W-1 | 176. | Ordinary Farm Practices | 143. | .807 |
| W-2 | 130. | Ordinary Farm Practices | 69.5 | .528 |
| W-6 | 40.4 | Ordinary Farm Practices | .036 | .0008 |
| W-10 | 19.7 | Ordinary Farm Practices | 28.0 | 1.39 |

For the areas Y-2 and W-1 using the same method of analysis used in a previous report, area Y-2 with conservation practices had 0.298 inch per hour peak runoff as compared with a computed amount of 0.334 inch per hour. As rapidly as possible similar analysis will be made on other areas from which records are now being obtained. The low runoff rate for area W-6 for this storm cannot be satisfactorily explained."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"At Edwardsville precipitation for the month was 8.56 inches as compared to the normal of 2.6 inches. This exceeds any previous record of precipitation for November at Edwardsville. The highest on record at St. Louis for November is 8.63 inches in 1847, and there have been no other Novembers in 110 years of record with precipitation above 8 inches.

Precipitation was generally at moderate intensities and there were no high rates of runoff. The runoff from the 50-acre pastured watershed was 5.08 inches. This high amount of runoff was somewhat due to the 2.63 inches of precipitation which occurred on October 31 and gave a wet condition of the soil at the beginning of the month."

Runoff Studies - V. D. Young, Fayetteville, Arkansas.-"There were 11 days during November on which precipitation occurred on the Bentonville watersheds. The rainfall varied from 9.90 to 11.52 inches between stations with a mean for all gages of 10.54 inches. This was the largest precipitation recorded for the month of November in 40 years of record at Bentonville. These rains followed a long dry spell and were of a relatively low intensity rate. The runoff from the various watersheds were as follows: W-I seeded to fall oats 31.2 percent; W-II good pasture cover 1.54 percent; W-III good cover grass and brush 0.78 percent; W-IV farm woods, good litter cover, poor canopy 2.37 percent; W-V mixed crop stripped 4.64 percent; and W-VI, terraced meadow with top terrace interval in cornstalks 19.33 percent.

"During the month of November there were 12 days on which precipitation occurred on the Muskogee watersheds. The monthly totals for the watershed gages varied from 6.33 inches to 7.19 inches with a mean for all four watersheds of 6.84 inches. (See table on page 18.) From these data it will be noted that the peak rates of runoff were small and that the total runoff for the watersheds was light. About two-thirds of W-I watershed had a poor cover as it consisted of corn stubble while the balance was in alfalfa meadow; W-II is a terraced area having mixed crops; W-III closely grazed pasture and W-IV mixed meadow and pasture with a good cover. As shown, the runoff varied from 3.86 percent on W-IV to a high of 13.8 percent from the closely grazed meadow.

"Precipitation occurred on 9 days during the month of November on the Garland, Tex. watersheds. The recorded precipitation varied between 10.99 inches and 12.08 inches with a mean of four gages of 11.53 inches. The table on page 19 shows the rainfall, approximate time of the peak rate of runoff, and the peak rate of runoff not corrected for pondage. From these data it will be noted that the largest rates were produced from watersheds W-IV (Hill) and W-V (Davis) and that those from W-V exceeded those of W-IV. There was insufficient time since the records were received by this office to tabulate and compile the rainfall and runoff for this report, only daily precipitation totals and peak stages of runoff were used."

Runoff Studies - T. W. Edminster, Blacksburg, Virginia.-"The major portion of the Project Supervisor's time has been spent in the preparation of the Ridges and Valleys Hydrologic Data Report. Upon completion of tentative manuscript, a series of conferences were held with Mr. D. B. Krimgold in the Washington Office during the week of November 18. Several revisions were made in the general format of the material

PRECIPITATION - RUNOFF - Muskogee, Okla.
November, 1946

| Date | W-I (Stebbins) | | | W-II (Stone) | | | W-III (Reid) | | | W-IV (Trumbo) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rain-fall | Peak rates | Runoff | Rain-fall | Peak rates | Runoff | Rain-fall | Peak rates | Runoff | Rain-fall | Peak rates | Runoff |
| | Inches | Ins/hr. | Inches | Inches | Ins/hr. | Inches | Inches | Ins/hr. | Inches | Inches | Ins/hr. | Inches |
| Nov. 1 | 0.50 | | | 0.37 | | | 0.58 | 0.025 | 0.0037 | 0.61 | | |
| 2 | 1.82 | 0.5167 | 0.1770 | 1.81 | 0.0754 | 0.1412 | 1.76 | .142 | .3039 | 1.84 | 0.001 | 0.0008 |
| 3 | .70 | .0628 | .0315 | .67 | .0134 | .0166 | .72 | .024 | .0292 | .70 | .001 | .0022 |
| 4 | .02 | | .0002 | .03 | | .0004 | .03 | | .0002 | .02 | | .0003 |
| 5 | 1.49 | | .1563 | 1.23 | | .0665 | 1.41 | .024 | .1133 | 1.29 | | .0145 |
| 6 | .79 | .0766 | .2597 | .69 | .0375 | .1249 | .83 | .066 | .2269 | .91 | .014 | .0906 |
| 7 | | | | | | | | | | | | .0006 |
| 10 | .06 | | | .05 | | | .08 | | | .07 | | |
| 11 | .08 | | | .23 | .0176 | .0059 | .12 | | | .13 | | |
| 15 | .59 | .0432 | .0188 | .59 | .0790 | .0343 | .62 | .042 | .0634 | .56 | .008 | .0296 |
| 16 | | | | .02 | | .0002 | | | | | | .0079 |
| 17 | | | | | | | | | | | | .0016 |
| 24 | | | | .26 | | | .65 | | | .12 | | |
| 18 | | | | | | | | | | | | .0009 |
| 19 | | | | | | | | | | | | .0002 |
| 25 | .74 | .0623 | .0675 | .37 | .2033 | .0353 | .39 | .171 | .2556 | .76 | | |
| 26 | .02 | | .0001 | .01 | | .0003 | | | .0001 | .02 | .027 | .1220 |
| TOTAL | 6.81 | | 0.7111 | 6.33 | | 0.4256 | 7.19 | | 0.9963 | 7.03 | | 0.2712 |

WATERSHED STUDIES - Garland, Texas
November, 1946

| Date | W-I (Guthrie) 25 A: Rain-fall | Approx. time of peak | Peak rate | W-III (Oats) 10.4 A.: Rain-fall | Approx. time of peak | Peak rate | W-IV (Hill) 16.2 A. : Rain-fall | Approx. time of peak | Peak rate | W-V (Davis) 14.5 A. : Rain-fall | Approx. time of peak | Peak rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inches | | cfs/A. | Inches | | cfs/A. | Inches | | cfs/A. | Inches | | cfs/A. |
| Nov. 1 | 1.12 | -- | -- | 1.14 | 11:15 P | 0.069 | 1.10 | -- | -- | 2.55 | 11:47 P | 0.496 |
| 2 | 3.10 | -- | -- | 2.90 | -- | -- | 2.84 | 10:07 A | 0.116 | 2.59 | 9:50 A | 2.413 |
| | | 11:42 A | .032 | | | | | 11:18 A | .209 | | 11:15 A | 1.482 |
| | | 4:50 P | .062 | | 4:04 P | .123 | | 4:14 P | .388 | | 4:11 P | .780 |
| 3 | 2.39 | 2:25 P | .432 | 2.24 | 2:00 P | .331 | 2.33 | 1:47 P | 1.043 | 2.34 | 6:57 A | 2.290 |
| 4 | .16 | | | .16 | | | .16 | | | .13 | | |
| 5 | 3.49 | 1:40 A | .266 | 2.54 | 1:50 A | .308 | 2.70 | 1:32 A | .345 | 2.81 | 1:38 A | 1.082 |
| | | | -- | | -- | -- | | 2:35 A | .227 | | 2:17 P | .612 |
| | | 3:20 P | .210 | | 2:48 P | .992 | | 2:52 P | 1.210 | | 5:20 P | .980 |
| | | 10:30 P | .296 | | 10:05 P | .505 | | 10:13 P | .680 | | 8:45 P | .342 |
| 6 | .65 | 2:45 A | .251 | .87 | 2:20 A | .769 | .84 | 2:21 A | .692 | .62 | 1:27 A | .524 |
| 9 | .25 | -- | -- | .27 | 4:44 P | .049 | .27 | -- | -- | .25 | 5:05 P | .168 |
| 15 | .76 | 10:35 P | .0053 | .87 | 9:37 P | .158 | .87 | 9:26 P | .586 | .78 | 10:00 P | .597 |
| 16 | .01 | | -- | | | | .02 | | | .01 | | |
| TOTAL | 11.93 | | | 10.99 | | | 11.13 | | | 12.08 | | |

and decisions were made as to final values, etc. to be used in the development of the design curves. Final revisions on this manuscript are now in process and should be completed within the next month.

"A tentative outline was prepared to cover a paper on Farm Pond Problems in the Southeast for presentation at the annual Southeastern Section meeting of the ASAE to be held in Biloxi, Mississippi. This outline was tentatively approved by Dr. Nichols and will now be completed for final approval."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.- "Mr. Anderson rebuilt the 2-1/2-inch pipe drop inlet model, setting the conduit on a 2.5 percent slope. This model was tested and the data analyzed by the same methods used for the pipe set on a 30 percent slope. The local pressure variation from the hydraulic-grade line caused by the sharp corner at the junction of the riser and the conduit compared well with the variation obtained for the tests with the conduit on a 30 percent slope. The average loss of head in the riser and the bend for this model is 0.9 of the velocity head compared with 0.75 of the velocity head for pipes set on a 30 percent slope. Comparison of the friction factors obtained from the test data with published plots of the friction factor for smooth tubes for equal Reynolds numbers shows that the observed friction factors are approximately 15 percent higher than the ones for smooth tubes. This variance of the friction factor probably is caused by the fact that the test section of the pipe which was used for determining the friction factor was too near the riser. The test section used was from 8 to 18 diameters below the riser, and consequently the normal velocity distribution had not been obtained at this point. Some investigators recommend that the test section be as far as 80 diameters below a bend in the pipe. Any deviation of the calculated friction factor from the true value would change the value of the riser head loss coefficient. It may be necessary to determine the friction factor for Lucite pipe for normal flow distribution in the pipe, conduct tests to show the distance required to establish normal flow distribution for pipe drop inlets, and measure the excess of lost head in the pipe caused by the bend at the foot of the riser."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"Channel U4 is a unit channel planted to yellow bluestem (Ischaemum) in the Spring of 1945. The grass was not mowed and the channel was tested in the fall of 1945. This first series of tests is known as experiment 1. During 1946 the grass was kept mowed to a height of 4 inches and tested this fall (experiment 2). Comparing the results of the two experiments shows that:-

(1) For low flows (before submergence takes place) the retardance coefficients were higher for experiment 2 (mowed grass) than for experiment 1.

(2) For high flows (after submergence has occurred) the retardance coefficients are lower for the mowed grass than for the uncut.

"The higher retardance coefficients for the low flows through the mowed grass is due to the increased bulk of material near the bed of the channel. This increased bulk includes additional vegetation due to the 'stooling out' of the clipped grass clumps and additional vegetal debris accumulated during the past year. After submergence of the grass has taken place, the grass density effects are 'drowned out.' The effect of length of cover then predominates, with the retardance coefficient being much higher for the taller grasses than for the shorter. Table I is a comparison of the results of experiment 1 and 2.

Table I
(All Values Interpolated from Plotting)

| VD[1] | Expt. 1 Manning's n | Expt. 2 Manning's n |
|---|---|---|
| 0.003 | 0.23 | 0.46 |
| .01 | .215 | .41 |
| .03 | .215 | .44 |
| .10 | .225 | .49[2] |
| .3 | .27 | .305 |
| .6 | .325[3] | .18 |
| 1.0 | .29 | .125 |
| 3.0 | .13 | .070 |
| 7.0 | .071 | .052 |

1/Product of velocity and depth of flow.

2/Submergence of vegetation just about to begin for experiment 2.

3/Submergence of vegetation just about to begin for experiment 1.

Drainage Studies - W. J. Liddell, Athens, Georgia.-"The corn plots were harvested this month. Yields were taken from 14 varieties on each of the 24 plots. In addition a population count was made in order to determine the stand. Measurements of root and stalk lodging and ear size were made for the Plant Pathology Department of the College which is cooperating in this experiment.

"A statistical analysis of variance was made of the data with the following preliminary results from spacing studies within the row:

Irrigated Corn:

| | Bu/Acre | |
|---|---|---|
| 12-inch Spacing | 61.4 | Better than 24 inches and 18 inches |
| 18-inch Spacing | 54.9 | Better than 24 inches |
| 24-inch Spacing | 47.1 | |

Difference required:
Significant - 5.0 bushels
Highly significant - 11.5 bushels

Unirrigated Corn:

| | Bu/Acre | |
|---|---|---|
| 12-inch Spacing | 55.0 | Better than 24 inches |
| 18-inch Spacing | 49.6 | Better than 24 inches |
| 24-inch Spacing | 42.3 | |

Difference required:
Significant - 5.9 bushels
Highly significant - 13.6 bushels.

"The rainfall was excellent from the standpoint of field corn this season, there being a total of 13.20 inches well distributed over the growing season from June 10 to September 30. Four inches of supplemental irrigation water were applied to the test plots. This gave a uniform increase of about 5 bushels per acre, but with the single replication studied this is not within limits of significance.

"Varietal studies indicated that three of eight hybrids were superior this season to the other hybrids and the six standard varieties. These results will be given in detail in the annual report."

Drainage Studies - E. G. Diseker, Raleigh, North Carolina.- "(1) Plymouth Test Farm: The writer has been at the test farm almost constantly since November 11, completing preliminaries and installing the drainage experiment. Laying of all tile has just been completed; however, a few open ditches are yet to be cut with the trenching machine. Bed drains, V-ditches, head walls and small field ditches are to be blasted, and several other details have not been completed. Every effort is being put forth to complete this experiment by December 31, otherwise Triple A payments for these practices will not be collected inasmuch as drainage is not a Triple A practice in Washington County, and a special concession was granted by Triple A in the event that the experiment would be completed by the above date.

"(2) Bethel Experiment: Recently a profile was laid out and survey made for the tile main which is to be used for by-passing the quick sand areas in the outlet ditch. Delivery of tile for this job has not been made."

Drainage Studies - James Turnbull, Lake Alfred, Florida.-"During the month of November it was necessary to start irrigating the experimental plots. There were only three small rains during the month. Interception data were obtained on each rain.

"Both the lake level and the water table continued to drop, the lake level more slowly than the water table except when water is being pumped from the lake for irrigation. Wells as far as 500 feet from the lake now register a water-table elevation lower than lake level. Tests were made on two trees to determine the effect of a large quantity of water applied over a considerable period of time on the 'dry bodies' which have developed under the trees. Eighteen inches of irrigation water applied over an 18-hour period wet up all the dry bodies under one tree while 21 inches of irrigation water applied over a 20-hour period failed to wet the dry bodies under the second tree. Although both trees were thought at first to have had the same type of cultivation it has been determined that the tree under which the dry bodies wet up was hoed about a year ago. The other tree had not been hoed. This confirms the belief that stirring is effective in making the soil wettable under field conditions."

Drainage Studies - C. Kay Davis, The Everglades Project, Fort Lauderdale, Florida.-"The boards have again been installed in the dam across the West Holloway canal and we are preventing further drainage of the area north of the North New River canal and west of the 40/41 range line. There is practically no flow below the dam at 26-Mile Bend. All of the canal waters are being diverted west into the open 'glades and east into the water-retention area.

"Last week the Everglades Drainage District approved a request made by the Dade County Water Control Commission for establishment of a water-recharge area consisting of about 675 square miles in Broward and Dade counties. This area extends west from 20-Mile Bend on the North New River Canal to the border of the Everglades, south along the west edge of the organic soils to the Tamiami Trail, east on the Tamiami Trail to the 38/39 range line, and thence north along this range line to the vicinity of 20-Mile Bend. No further sales of lands will be made in this area.

"With the establishment of this recharge area three such areas have been set aside during the past 6 months. About 110,000 acres was set aside as a Fish and Wildlife Refuge north of the Hillsboro canal in what is generally referred to as the Hillsboro Lake area. Another area was designated west of the 40/41 range line and north of the North New River canal to include all of the Loxahatchee peat lands south of the Hillsboro canal.

This area has been designated as a water-retention area and consists of about 100,000 acres. The third water-retention area was described in the above paragraph. I consider this a very definite progressive step in the conservation of water and soil resources in the Everglades.

"The Everglades Drainage District held their meeting on December 5, and at this meeting they designated the location of Canal 'A' between the North New River canal and the Hillsboro canal, as will be proposed in our project report. By designating the location of this canal the property owners in this vicinity can now form themselves into a tax unit and either start the excavation for the canal or plan their water control for the eventual use of this canal."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Rainfall records for the month of November show that during the first few days of the month heavy showers fell generally over all the area. After November 4, rainfall in the south end was confined to light showers. In the area around Peters two heavy rains occurred on the 11th and 24th. As a result of these heavy rains the wells from well No. 19 on Eureka Road to Peters showed a definite increase for the period October 28 to November 25. All of the rest of the area shows a decrease in water table from 0.28 of a foot to 0.94 of a foot for Well No. 27.

"The greater loss in water table for the area around Well No. 27, is no doubt due to the following: Well No. 27 is approximately in the middle of an area of 320 acres that has been scarified and planted the past year. While the trees are growing well, there is no ground cover and this, combined with the high winds during the latter part of the month, has tended to dry this area out more than other areas which have a ground cover.

"During the latter part of the month the readings of our moisture plots on the natural cover, check, and shavings plot, have increased quite a bit more than the readings on the pine straw or grass mulch plots. The pine, straw, and grass mulched areas seem to be able to retain moisture much more efficiently than shavings.

"General moisture studies carried on at the Sub-Tropical Experiment Station and with cooperating grove areas indicate that during the latter part of the month moisture had dropped to a critical point. Grove men point to this as advantageous, as during this period when frosts may occur it is desirable to throw the trees into a period of dormancy.

"Pumping on our water control plot was continued throughout this period. While it was noticed that we had materially lowered the water table internally within the diked area, we were able, by keeping the water in the ditches low, to dry this area out sufficiently so that it could be plowed 15 days earlier than adjacent areas. Results to date indicate that to adequately drain these marls it will require a rather intensive system of internal drainage. At the end of the season ditches will be plowed at

least 12 inches deep at spacings from 25 feet to 50 feet to determine the spacing required. Also as soon as possible infiltration studies will be carried on to help get some data on this area."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"During the remainder of the month an additional permeability site was taken in Nansemond County and one draw-down curve installation completed on the Park Brinkley farm in Nansemond county. Here 15 observation wells were installed in Lenoir soil. The wells were extended across a tile line that had been completed during the spring of 1946. All wells were 5 feet in depth and were spaced from the tile 2, 3, 5, 5, 5, 10, 10, 15, and 25 feet. Some time has been spent in collecting bids on additional pumps and observation wells for use in extending the draw-down curve studies in Virginia."

Sedimentation Studies - L. C. Gottschalk, Washington, D. C.-"The engineer assigned by the U. S. Bureau of Reclamation to compile an inventory of published and unpublished sediment-load data from files of the Sedimentation Section completed this work during the month. The inventory will be published under the sponsorship of the Federal Interagency River Basin Committee's Subcommittee on Sedimentation.

"A paper entitled 'Erosion Control on Watershed Lands' by Carl B. Brown, was published in the Journal of American Water Works Association, October 1946. This article discusses the effects of sedimentation on water-supply reservoirs and methods of watershed control. It outlines briefly the past accomplishments in controlling erosion on watershed lands through the Soil Conservation Districts programs, the amount of conservation work still needed, and the part that reservoir owners can play in cooperating with Soil Conservation Districts to the mutual benefit of reservoir owners and land owners."

IRRIGATION DIVISION

Consumptive Use of Water.-Blaney reports "Bulletin 52, Salinas Basin Investigation" was issued by the Division of Water Resources, State of California. This bulletin was based on a cooperative research program and contains a chapter on "Consumptive Use of Water" by Harry F. Blaney and a chapter on "Irrigation Practices" by Paul A. Ewing.

Infiltration from Rainfall.-Muckel reports for Chino Basin, Upper Santa Ana River, San Bernardino County, Calif.:

"Two series of soil samples were taken during the month to determine rainfall penetration on agricultural areas. Total precipitation during November was the highest for the past 46 years of record varying from 6 to over 8 inches in Chino Basin. Penetration was 4 to 5 feet in dry areas and in recently irrigated fields the penetration was beyond the root zone. A series of samples in unirrigated grapes and on very sandy soils showed penetration of 3 to 5 feet. These soils were so dry previous to the rains that sampling was impossible with a King tube owing to caving. Preliminary information indicates that the root zone of the grapes is probably not as deep as might be expected, probably not more than 10 or 11 feet. This will be determined more closely next spring."

Bloodgood reports.-"The irrigation water used at San Pedro Farms near Fort Stockton, Tex., is supplied from several springs with a combined flow of approximately 6 second-feet. The water is used continuously for a 362-day irrigation season for 24 hours each day. In addition to spring water, the farm uses about 3 weeks flow of 18 second-feet of waste water from the Fort Stockton Irrigation District in January during the non-irrigation season. The farms use approximately 5,100 acre-feet of water per year to irrigate 600 acres of alfalfa; 900 acres of wheat, barley, oats, and spelt; 100 acres of grain sorghum and milo maize; and 75 acres of cotton, or a total of 1,675 acres. The use of water for all crops is about 3.04 acre-feet per acre. During 1946, an unusually dry year, 275 acres of alfalfa produced 5 tons of alfalfa per acre. During normal years 200 acres of alfalfa produced an average yield of 9 tons per acre. The 900 acres of wheat, barley, oats, and spelt often heavy grazing during winter months produced an average of 40 bushels of grain per acre. The average yield of lint cotton per acre is about 500 pounds.

"Next season the San Pedro Farms plans to install three concrete weirs to measure all of the water used on the farm. I plan to supervise the installation of the weirs and furnish three recorders to be used for the measurement of water.

"A number of wells have been drilled in the Fort Stockton Area recently for irrigation purposes. One oil man is planning to drill two wells to irrigate about 1,000 acres. Oil men are becoming water and irrigation minded. In the past they were only interested in oil but many of their

wells were non-producers of oil but did furnish a large supply of good water that might be utilized for irrigation purposes. So, if they did not get a good oil well, they usually had a good water well, and, consequently, are interested in irrigation farming as a side line, which in the long run might prove more profitable than an ordinary oil well.

"One of these wells were drilled recently on the Sibley Ranch near Fort Stockton. The driller did not get a good oil well but a good water well that was under artesian pressure. I was informed the water shot into the air for a distance of about 50 feet. The flow of this well is large and a sufficient quantity of water can be obtained to irrigate quite a large acreage. Dr. Sibley is one of the largest ranchers and land owners in the Trans-Pecos Area. He desires to use the water from this well to irrigate feed crops for his stock. Mr. Pritchett and I obtained a sample of water from this well (the well was capped but there was leakage around it) on our recent visit to Fort Stockton. The water analysis showed 640 ppm. Ca, 269 ppm. Mg., 245 ppm. Na/K, 255 ppm. $HCO_3$, 2,220 ppm. $SO_4$, 200 ppm. Cl, and total dissolved solids of 3,700 ppm. The Na percent is 19. This water is classified as good irrigation water for that area as it is high in sulphates and low in chlorides. It has an alkali coefficient of about 9.1 while the water of Comanche Springs, that is used for the irrigation of Fort Stockton Irrigation District land, is about 5.2 to 5.9. The higher the alkali coefficient the better the quality of irrigation water."

Canal Lining.-The canal lining manual is now being mimeographed and should be available for distribution soon.

The bulletin on seepage losses from canals is being revised and the chapters on methods of reducing seepage losses, methods of lining canals and the economics of canal lining are being eliminated. These chapters are included in the canal lining manual.

Soil Decline.-Blaney and Criddle report the completion of a study started in July 1946 to determine the rate of decline of productivity in irrigated areas for regions 6 and 7 (SCS). Work sheets were developed for determining the rates of decline resulting from: depletion of surface and ground-water supply; reservoir sedimentation; high water table and alkalinity; deposition and erosion from irrigation of row crop, small grains, hay and pasture. Curves, showing rate of erosion for different slopes on irrigated lands were developed from best research data available.